DECLARATION OF LAWRENCE GREENFIELD ISO GOOGLE LLC'S MOTION FOR RELIEF RE PRESERVATION

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UNITED STATES DISTRICT COURT

NORTHERN DISTRICT OF CALIFORNIA, OAKLAND DIVISION

CHASOM BROWN, et al., on behalf of
themselves and all others similarly situated,

     Plaintiffs,

    vs.

GOOGLE LLC,

     Defendant.

Case No. 4:20-cv-03664-YGR-SVK

DECLARATION OF LAWRENCE GREENFIELD

1.   I am a Distinguished Software Engineer employed by Google LLC. I have been employed at Google since 2003, and I am the Area Tech Lead for Storage across Google Cloud Platform and Technical Infrastructure ("GCP/TI"). In my capacity as Area Tech Lead for GCP/TI, I am responsible for technical infrastructure and data storage issues affecting Google company-wide. As part of my duties, I am familiar with the costs to Google of various resources, including storage and processing resources. I make this declaration based on personal knowledge and information provided to me by Google colleagues, and if called to testify, I could and would competently testify to such facts.

2.   I understand the Court issued preservation orders in the above-captioned case, and in a related case *Calhoun v. Google*, requiring that Google preserve data in various sources. I further understand that various teams at Google have implemented pipelines for preservation of data from those sources. I also understand members of those teams have submitted declarations regarding the storage and processing resources that have been required to develop and implement those pipelines.

3.   Due to the Covid-19 outbreak and subsequent constraints in the global supply chain for chips and other products, Google and other companies in the industry face ██████████

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2   4.   As one specific example, since December 2021, Google has had to implement

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8 ███████████████████████ Incremental storage demand caused by the Court's preservation

9 orders places further strain on those resources.

Methodology for Estimating the Cost to Google of Storing Data

11   5.   The cost to Google of storing data includes many contributing factors. For example, there are costs associated with hardware such as servers, overhead costs like infrastructure and electricity required to house, power, and cool the storage hardware, and costs associated with the various employees who support and maintain the storage infrastructure. Estimating the cost of storing a given amount of data for a given length of time by attempting to calculate all of those associated costs would be a highly complex exercise.

17   6.   However, Google offers a service to the public called Google Cloud Storage (GCS) that allows businesses or individuals to store and retrieve data for a fee. The pricing of GCS, which is available at https://cloud.google.com/storage/pricing, includes the above-described costs associated with storage of data, such as overhead costs, etc. As of the date of this declaration, the lowest-cost storage option available on Google's Cloud Storage service is Archive storage, which is priced at $0.0012 per binary gigabyte (also known as "gibibyte") per month, or $0.0011 per gigabyte per month, if sitting in a low cost region of the country. This figure can be used as a conservative estimate of the cost to Google of storing a large amount of data. Typically, customers choose low-cost storage at a tradeoff, because Google charges more to access the data from archive storage than from more expensive "nearline" storage. If Plaintiffs would require access to read this data, Google would incur additional significant costs for computing power, electricity, and the like, but we are not including those costs in this calculation.

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7.   GCS pricing is also useful as a measure of the cost to Google of storing data because if Google itself uses some amount of storage space (a limited resource), then Google cannot offer that space to the public as part of its GCS service. In fact, because the volume weighted mix of GCS usage is towards higher cost options, if Google were to turn away business due to capacity constraints, that lost business would likely be a larger number than the cost calculated using the lowest-cost storage option described above.

Estimates of the Cost to Google of Storing Data Pursuant to the Court's Preservation Orders (Excluding ▮ Mapping/Linking Tables)

8.   Based on the declarations of Benjamin Kornacki (▮ Ads),   Julian Kranz (▮ ChromeSync), Joshua Halstead (▮ and mapping/linking tables in ▮), Patrick Quaid (mapping/linking tables in ▮), Srilakshmi Pothana (mapping/linking tables maintained by the Google Analytics team) and information available to me on Google's internal tool ▮, I understand the preservation pipelines for data sources listed below from the Court's preservation order will require storage of the following amounts of data:

Data source	Amount of data stored currently	Estimated additional data per day
▮ Ads	▮	▮
▮ Analytics	▮	▮
▮	▮	▮
UMA	▮	▮
▮ ChromeSync	▮	▮
DBL and GAIA ▮	▮	▮
Mapping/linking tables in ▮	▮	▮
Mapping/linking tables in ▮	▮	▮
Mapping/linking tables maintained by the Analytics team	▮	▮ every 25 days
TOTAL	▮	▮ **(excluding mapping/linking tables**

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		maintained by the Analytics team)

9. Using the above-described storage cost figure of $0.0011 per GB per month, the total cost of storing this data after one, two, and three years are as follows:

Data source	Approximate total cost after one year	Approximate total cost after two years	Approximate total cost after three years
▅▅▅ Ads	▅	▅	▅
▅▅▅ Analytics	▅	▅	▅
▅▅▅	▅	▅	▅
UMA	▅	▅	▅
▅▅▅ ChromeSync	▅	▅	▅
DBL and GAIA ▅	▅	▅	▅
Mapping/linking tables in ▅	▅	▅	▅
Mapping/linking tables in ▅	▅	▅	▅
Mapping/linking tables maintained by the Analytics team	▅	▅	▅
TOTAL	▅	▅	▅

10. The calculations I used to generate these estimates are:

- For mapping/linking tables maintained by the Analytics team:[1]

    ○ **Approximate total cost after one year** = ▅▅▅ * $0.0011 per GB per month * 12 months + ▅▅▅ * $0.0011 per GB per month * 11 months + … + ▅▅▅ * $0.0011 per GB per month

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[1] Based on the declaration of Srilakshmi Pothana, I understand preserving the tables maintained by the Analytics team (excluding ▅ particular Analytics tables discussed in paragraphs 13-15 here) will require approximately ▅▅▅ every 25 days. For ease of calculation, I will assume that preserving these ▅ tables will require approximately ▅▅▅ every month.

1   * 2 months + ███ * $0.0011 per GB per month * 1 month

2   ○ **Approximate total cost after two years** = ███ * $0.0011

3   per GB per month * 24 months ███ * $0.0011 per GB per

4   month * 23 months + … + ███ * $0.0011 per GB per month

5   * 2 months + ███ * $0.0011 per GB per month * 1 month

6   ○ **Approximate total cost after three years** = ███ * $0.0011

7   per GB per month * 36 months + ███ * $0.0011 per GB per

8   month * 35 months + … + ███ * $0.0011 per GB per month

9   * 2 months + ███ * $0.0011 per GB per month * 1 month

10   ● For the other data sources listed above:

11   ○ **Approximate total cost after one year** = [Amount of data stored

12   currently in ██] * $0.0011 per GB per month * 12 months +

13   [Estimated additional data per day in ██] * ($0.0011 per GB per

14   month / 30 days) * 365 days + [Estimated additional data per day in

15   ██] * ($0.0011 per GB per month / 30 days) * 364 days + … +

16   [Estimated additional data per day in ██] * ($0.0011 per GB per

17   month / 30 days) * 2 days + … + [Estimated additional data per day

18   in ██] * ($0.0011 per GB per month / 30 days) * 1 day

19   ○ **Approximate total cost after two years** = [Amount of data stored

20   currently in ██] * $0.0011 per GB per month * 24 months +

21   [Estimated additional data per day in ██] * ($0.0011 per GB per

22   month / 30 days) * 730 days + [Estimated additional data per day in

23   ██] * ($0.0011 per GB per month / 30 days) * 729 days + … +

24   [Estimated additional data per day in ██] * ($0.0011 per GB per

25   month / 30 days) * 2 days + … + [Estimated additional data per day

26   in ██] * ($0.0011 per GB per month / 30 days) * 1 day.

27   ○ **Approximate total cost after three years** = [Amount of data stored

28   currently in ██] * $0.0012 per GB per month * 36 months +

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[Estimated additional data per day in ▮] * ($0.0011 per GB per month / 30 days) * 1095 days + [Estimated additional data per day in ▮] * ($0.0011 per GB per month / 30 days) * 1094 days + … + [Estimated additional data per day in ▮] * ($0.0011 per GB per month / 30 days) * 2 days + … + [Estimated additional data per day in ▮] * ($0.0011 per GB per month / 30 days) * 1 day.

Estimates of the Cost to Google of the ▮▮▮▮ Tables

11.   Based on the declaration of Daryl Seah, I understand preserving the ▮ ▮▮▮ tables will require approximately ▮▮▮ per day.

12.   Again using the above-described storage cost figure of $0.0011 per GB per month and the calculation described in paragraph 10, the total cost of preserving these tables will be approximately: ▮▮▮ after one year, ▮▮▮ after two years, and ▮▮▮ after three years.

Estimates of the Cost to Google of the ▮▮ Analytics Tables

13.   Based on the declaration of Srilakshmi Pothana, I understand preserving ▮▮ particular Analytics tables will require approximately ▮▮▮ every 25 days. For ease of calculation, I will assume that preserving these ▮▮ tables will require approximately ▮▮▮ every month.

14.   Again using the above-described storage cost figure of $0.0011 per GB per month, the total cost of preserving these tables will be approximately: ▮▮▮ after one year, ▮▮▮ after two years, and ▮▮▮ after three years.

15.   The calculations I used to generate these estimates are:

- **Approximate total cost after one year** = ▮▮▮ * $0.0011 per GB per month * 12 months + ▮▮▮ * $0.0011 per GB per month * 11 months + … + ▮▮▮ * $0.0011 per GB per month * 2 months + ▮▮▮ * $0.0011 per GB per month * 1 month

- **Approximate total cost after two years** = ▮▮▮ * $0.0011 per GB per month * 24 months + ▮▮▮ * $0.0011 per GB per month * 23 months + … + ▮▮▮ * $0.0011 per GB per month * 2 months +

1   ███████ * \$0.0011 per GB per month * 1 month

2   ● **Approximate total cost after three years** = ███████ * \$0.0011 per

3   GB per month * 36 months + ███████ * \$0.0011 per GB per month *

4   35 months + … + ███████ * \$0.0011 per GB per month * 2 months

5   + ███████ * \$0.0011 per GB per month * 1 month

7   I declare under penalty of perjury that the foregoing is true and correct.

8   Executed on the 25th day of October 2022 at New York, New York.

10   By: *DocuSigned by:*

                         Lawrence Greenfield

11   Lawrence Greenfield